ENERGY SAFETY CANADA

SAFETY ALERT

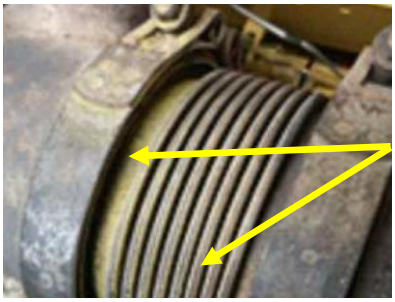
ISSUE # 05-2022

Exposure Hazard: Hexavalent Chromium

Description:

In response to a manufacturer's notification, a midstream company conducted an exposure assessment of hexavalent chromium in a previously unidentified location. This assessment identified the need for controls to prevent overexposure.

Chromium present in stainless steel may form as a residue on the exterior and sometimes interior engine or turbine components. This chromium is hexavalent (Cr^{6+}), which is a carcinogen and a skin and respiratory sensitizer. It forms when metal in an oxidizing or corrosive environment is in contact with calcium oxide-containing materials, such as thread sealants or insulation. The generation of Cr^{6+} increases at elevated temperatures and often appears as a yellow or white residue on engine components and adjacent insulation surfaces.



Chromium residue on exhaust manifold

Chromium residue on insulation

Image source: Caterpillar Information Bulletin

What Went Wrong:

- The presence of this residue and how it is produced was not known until the last few years.
- The residue may often be mistaken for sulfur and can be difficult to see with typical sodium lights.
- Exposure may occur if the residue is disturbed during tasks such as sampling, maintenance activities, or hot work like grinding and welding.
- Routes of exposure include inhalation, skin contact and ingestion.
- Cr^{6+} has very low airborne exposure limits such as 0.0002 mg/m^3 or 0.01 mg/m^3, depending on the jurisdiction.

Actions Taken/Recommendations:

- Determine if stainless-steel components combined with calcium oxide-containing materials and elevated temperatures are present in your operations.
- Implement an exposure control plan (ECP) to protect personnel when suspected or confirmed Cr^{6+}-containing residues may be present.
- Conduct visual inspections and testing (wipe sample or colorimetric swab) for presence of Cr^{6+}.
- The use of a 10% citric or ascorbic acid water/soap mixture can transform (~15 minutes) the hexavalent chromium to its' trivalent form (Cr^{3+}), which is less toxic and, when wet, less likely to be airborne. Ensure the acid water/soap mixture is removed from the metal to avoid future chromium residue generation.
- When chromium residue may be disturbed, use personal protective equipment—such as respirators equipped with P100 filters, disposable suits, and nitrile gloves—combined with good hygiene practices.

Energy Safety Canada Resources:

- Controlling Chemical Hazards Program
- Developing an Exposure Control Plan Safety Bulletin
- Fit for Duty Guideline

Other Resources:

- Energy UK: Hexavalent Bulletin Safety Summary
- HRSG Forum, David Addison, Hexavalent Chromium in CCGT Plants - Presentation Video
- Caterpillar Information Bulletin: Hexavalent Chromium on Engines
- NIOSH Criteria for a Recommendation Standard for an Occupational Exposure to Hexavalent Chromium

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